FCC§15.247 (i), §1.1307 (b) (3) &§2.1093 – RF EXPOSURE

Applicable Standard

According to FCC §2.1093 and §1.1307(b) (3), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D04 Interim General RF Exposure Guidance

SAR-Based Exemption:

SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum timeaveraged power or maximum time-averaged ERP, whichever is greater.

Per § 1.1307(b)(3)(i)(B), for single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2) of this section): A single RF source is exempt if:

the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20\,cm}(d/20\text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20\,cm} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\,cm}\sqrt{f}}\right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20\,cm} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

For multiple RF sources: Multiple RF sources are exempt if:

in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation:

$$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

For worst case:

Mode	Frequency (MHz)	Antenna Gain		Tune up conducted power		ERP		Evaluation Distance (m)	Pth (mW)
		(dBi)	(dBd)	(dBm)	(mW)	(dBm)	(mW)		
Wi-Fi	2412-2472	2.2	0.05	20	100.00	20.05	101.16	0.2	3060
WCDMA B2	1850-1910	1.59	-0.56	25	316.23	24.44	277.97	0.2	3060
WCDMA B4	1710-1755	2.0	-0.15	25	316.23	24.85	305.49	0.2	3060
WCDMA B5	824-849	2.53	0.38	25	316.23	25.38	345.14	0.2	1681
LTE B2	1850-1910	1.59	-0.56	25	316.23	24.44	277.97	0.2	3060
LTE B4	1710-1755	2.0	-0.15	25	316.23	24.85	305.49	0.2	3060
LTE B5	824-849	2.53	0.38	25	316.23	25.38	345.14	0.2	1681
LTE B12	699-716	3.95	1.8	25	316.23	26.8	478.63	0.2	1426
LTE B13	777-787	4.45	2.3	25	316.23	27.3	537.03	0.2	1585
LTE B14	788-798	3.63	1.48	25	316.23	26.48	444.63	0.2	1608
LTE B66	1710-1780	2.0	-0.15	25	316.23	24.85	305.49	0.2	3060
LTE B71	663-698	1.66	-0.49	25	316.23	24.51	282.49	0.2	1353

Note: The EUT contains a certified WWAN module (model: EC25-AF MINIPCIE, FCC ID: XMR201808EC25AF) granted on 08/03/2018.
The antenna gain was provided by applicant.

For simultaneously transmit consider:

Worst case Wi-Fi + LTE B13

The ratio=101.16/3060+537.03/1585=0.372<1

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliance